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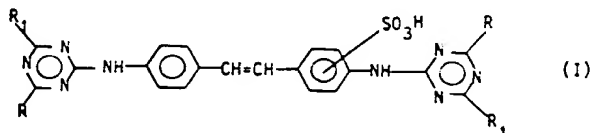
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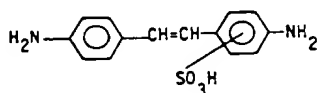
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(54) **S-triazine derivatives**

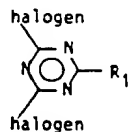
(57) Compounds of formula I



in which R and R<sub>1</sub> are amino, hydroxy, halogen or certain defined organic radicals; are obtained by various routes from compounds of formula II



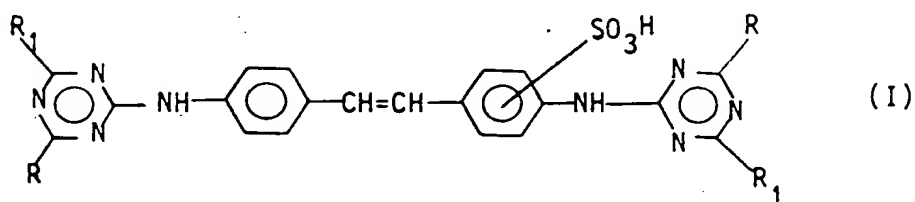
The compounds are useful as *optical brighteners*.



IMPROVEMENTS IN OR RELATING TO ORGANIC COMPOUNDS

The invention relates to a method for preparing asymmetric triazinyl-containing stilbene derivatives.

According to the invention, there is provided a process for  
5 preparing a compound of formula I,



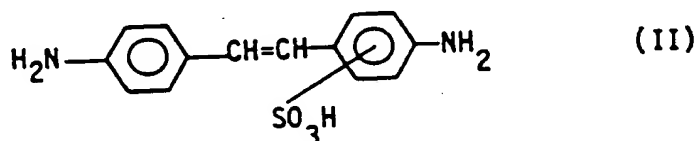
in which R is  $-NR_5R_6$ ,  $-SCH_3$ , halogen or  $-OR_5$ ;

$R_1$  has a significance of R, independent of R,

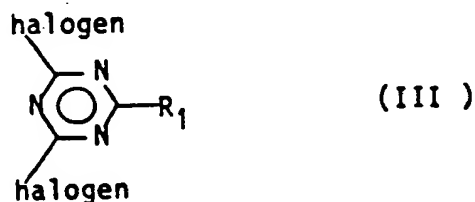
$R_5$  is hydrogen; phenyl, unsubstituted or substituted by one  
or two halogen atoms,  $C_{1-4}$ alkoxy, sulpho, mono- or  
10 di- $(C_{1-4}$ alkyl)-amino or  $C_{1-4}$ alkyl groups;  $C_{1-4}$ alkyl unsubstituted or  
monosubstituted by hydroxy,  $C_{1-4}$ alkoxy or cyano;  
 $-(CH_2-CH(R_{10a})-O)_m-R_{10}$  ;  $-(C_{1-4}$ alkylene)-CON $(R_{10})_2$ ;  
 $-(CH_2)_p-N(R_{10})_2$  or  $-(CH_2)_p-N^+(R_{10})_3 A^-$

where  $R_{10}$  is hydrogen or  $C_{1-4}$ alkyl,  $m$  is an integer from 1 to 10 inclusive,  $p$  is an integer from 1 to 4 inclusive,  $R_{10a}$  is hydrogen or methyl and  $A^{\ominus}$  is an anion;

$R_6$  is hydrogen; unsubstituted  $C_{1-4}$ alkyl; phenyl unsubstituted  
5 or substituted by one  $C_{1-4}$ alkyl group;  $C_{2-4}$ alkyl substituted by one hydroxy,  $C_{1-4}$ alkoxy or cyano group;  $[-CH_2CH(R_{10a})-O-]_m-R_{10}$  ;  
- $(C_{1-4}$ alkylene)- $CN(R_{10})_2$ ;  $-(CH_2-)_p-N(R_{10})_2$  or  $-(CH_2)_p-N^{\oplus}(R_{10})_3 A^{\ominus}$   
where  $R_{10}$ ,  $R_{10a}$ ,  $p$ ,  $A^{\ominus}$  and  $m$  are as defined above;  
or  $R_5$  and  $R_6$  together with the N-atom to which they are  
10 attached form a saturated heterocyclic amine group;  
comprising a) reacting one mole of a compound of formula II



with 2 moles of a compound of formula III



to form a compound of formula I, where  $R$  is halogen and  $R_1$  is as defined above; and

b) optionally further reacting with a compound of formula IIIa



where  $R_a$  is  $-NR_5R_6$ ,  $-SCH_3$  or  $OR_5$ ;

15 to form a compound of formula I where  $R_1$  is as defined above and  $R$  is selected from  $-NR_5R_6$ ,  $-SCH_3$  and  $OR_5$ .

According to one aspect of the invention, there is provided a process comprising

a) reacting one mole of a compound of formula II as defined above with 2 moles of a compound of formula III as defined above where  $R_1$  is halogen to form a compound of formula I where R and  $R_1$  are halogen;

5                    b) optionally reacting the compound of formula I where R and  $R_1$  are halogen with a compound of formula IIIb



where  $R_{1a}$  is  $-NR_5 R_6$ ,  $-SCH_3$  or  $-OR_5$ ; and

c) optionally reacting the compound of formula I where R is halogen and  $R_1$  is  $R_{1a}$  defined above; with a compound of formula IIIa



10                    where  $R_a$  is  $-NR_5 R_6$ ,  $-SCH_3$  or  $-OR_5$ ,

to form a compound of formula I where  $R_1$  is  $R_{1a}$  defined above and R is  $R_a$  where  $R_a$  is defined above.

15                    Further, the reaction of  $H-R_a$  and  $H-R_{1a}$  with a compound of formula I where R and  $R_1$  are halogen can be carried out at the same time or in separate steps.

20                    Preferably the reaction of the compound of formula II with that of formula III where  $R_1$  is halogen, is carried out at a pH from 1.5 to 6, more preferably 2 to 5.5. Preferably the temperature of the reaction of the compound of formula II with that of formula III is from  $-15^\circ\text{C}$  to  $+5^\circ\text{C}$ , more preferably from  $-5^\circ\text{C}$  to  $+2^\circ\text{C}$ . Preferably the reaction of the compound of formula II with that of formula III is carried out in one or more solvents selected from a) aqueous ketones

(such as methylethyl ketone or acetone), b) chlorinated hydrocarbons in water and c) water, a wetting agent (such as a sulposuccinate) and one or more C<sub>1-4</sub>alcohols (such as isopropanol or n-butanol). Usually, the yield is 95 to 99 % of theory.

5           Where R and R<sub>1</sub> in a compound of formula I is halogen and the first halogen is reacted with H-R<sub>1a</sub>, the pH is preferably from 4-8, more preferably from 5 to 7 and the temperature of the reaction is preferably from 2 to 65°C, more preferably from 10 to 40°C. Usually the yield is 95 to 99 % of theory.

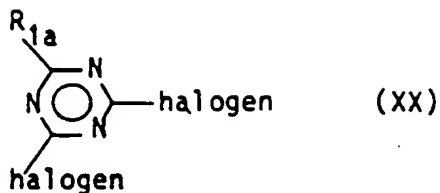
10           Where both R and R<sub>1</sub> in a compound of formula I are halogen and second halogen group is reacted with H-R<sub>a</sub>, the pH is preferably from 7 to 10, more preferably from 7.5 to 8.5 and the temperature of the reaction is preferably from 40 to 100°C. Usually the yield is 95 to 99 % of theory.

15           For the reaction of the compounds of formula I with H-R<sub>a</sub> and H-R<sub>Ia</sub> described above, the same solvent systems can be used as for the reaction of the compound of formula II with that of formula III.

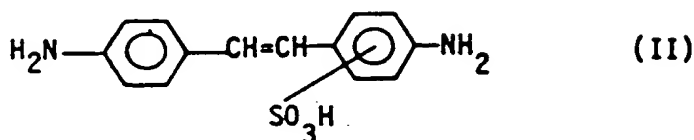
20           For the avoidance of doubt, in this Specification, where a range is given in this Specification, the numbers defining the range are included in the range.

25           According to another aspect of the invention, there is provided a process for preparing a compound of formula I, in which R is R<sub>a</sub> where R<sub>a</sub> is -NR<sub>5</sub>R<sub>6</sub>, -SCH<sub>3</sub> or -OR<sub>5</sub> and R<sub>1</sub> is R<sub>1a</sub> where R<sub>1a</sub> has a significance of R, and in which both groups R<sub>a</sub> are the same and both groups R<sub>1a</sub> are the same but R<sub>1a</sub> is different to R<sub>a</sub>, comprising reacting:

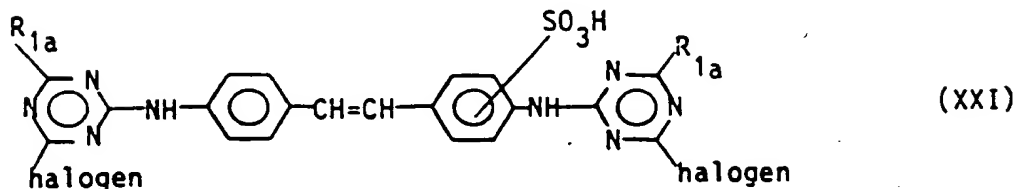
a) 2 moles of cyanuric halide (preferably cyanuric chloride) with 2 moles of H-R<sub>1a</sub> to form a compound of formula XX



b) reacting 2 moles of the compound of formula XX with 1 mole of the compound of formula II



to form a compound of formula XXI



and c) reacting 1 mole of the compound of formula XXI with 2 moles of H-Ra to form a compound of formula I where R is Ra and R<sub>1</sub> is R<sub>1a</sub> as defined above.

Preferably in the above reaction, R is R<sub>a</sub> where R<sub>a</sub> is anilino or morpholino and preferably R<sub>1</sub> is R<sub>1a</sub> where R<sub>1a</sub> is anilino or morpholino.

10 Preferably the reaction of cyanuric halide with H-R<sub>1a</sub> where R<sub>1a</sub> is as defined above (preferably anilino or morpholino), is carried out in methylethyl ketone or acetone. Preferably the temperature of this reaction is from -15°C to +5°C. The yield is usually 95 to 99 % of theory. Preferably the pH is from 1 to 4.

Preferably the reaction of the compound of formula XX with the compound of formula II is carried out at 10-40°C and preferably at a pH of 5 to 7. Preferably the compound of formula II is added as an aqueous slurry to the compound of formula XX. Usually, the yield is 95 to 99 % of theory.

Preferably the reaction of the compound of formula XXI with H-R<sub>a</sub> where R<sub>a</sub> is as defined above (preferably morpholino or anilino (depending on R<sub>1</sub>) is carried out at a temperature of from 40-100°C preferably 50-80°C (where necessary under reflux) and the pH is preferably from 7-10. The reaction may be carried out with the addition of KOH or NaOH. Usually the yield is 95 to 99 % of theory.

Preferably when R<sub>1</sub> is -OR<sub>5</sub> where R<sub>5</sub> is C<sub>1-4</sub>alkyl, the reaction of cyanuric halide with H-R<sub>1</sub> is carried out in a C<sub>1-4</sub>alcohol, preferably in the presence of sodium bicarbonate. Preferably the temperature of this reaction is from -15 to +5°C. Usually, the yield is 95 to 99 % of theory.

Preferably when R is -OR<sub>5</sub> (but different to R<sub>1</sub>) where R<sub>5</sub> is other than C<sub>1-4</sub>alkyl then the reaction of the compound of formula XXI with H-R<sub>a</sub> is carried out from 60-100°C. Preferably the reaction is carried out in the presence of sodium hydroxide. Usually, the yield is 90 to 95 % of theory.

Alternatively, according to another aspect of the invention, there is provided a process for preparing a compound of formula I, as defined above where both groups R and/or both group R<sub>1</sub> are -OC<sub>6</sub>H<sub>5</sub> comprising:

a) reacting 2 moles of cyanuric halide with 1 mole of the compound of formula II; and

b) reacting the product with 2 or 4 moles of phenol.

Preferably the reaction step a is carried out as described above at  $-15^{\circ}\text{C}$  to  $+5^{\circ}\text{C}$  and the reaction step b) is carried out at  $50$  to  $80^{\circ}\text{C}$ , preferably in a solvent selected from methylethyl ketone or acetone. Usually the yield is 95 to 99 % of theory.

Compounds of formula I can alternatively be formed by reacting  
 5 1 mole of the compound of formula II with 2 moles of cyanuric halide (preferably cyanuric chloride) and then reacting the product either with 2 moles of aniline followed by 2 moles of morpholine or 2 moles of morpholine followed by 2 moles of aniline to form a compound of formula I in which both groups  $R_1$  are unsubstituted morpholino and  
 10 both groups R are unsubstituted anilino. Usually the yield of the process is 90 to 95 % of theory.

Preferably R is  $R'$  where  $R'$  is  $-\text{NH}_2$ ,  $-\text{N}(\text{R}_6')_2$ ,  $-\text{NHR}_5'$ ,  $-\text{SCH}_3$ ,

halogen,  $\begin{array}{c} \text{R}_8 \\ | \\ -\text{N}-(\text{CH}_2)_n-\text{CH} \\ | \\ \text{CN} \end{array}$  ;  $-\text{OR}_8$  ,  $-\text{O}-\text{C}_6\text{H}_5$  or a saturated

heterocyclic amine group attached to the triazinyl group through the  
 15 N-atom; where  $R_4$  is hydrogen or methyl,  $R_5'$  and  $R_6'$  are defined below and  $R_8$  is hydrogen,  $\text{C}_{1-4}$ alkyl or  $\text{C}_{2-4}$ alkyl substituted by  $-\text{OH}$  or  $\text{C}_{1-4}$ alkoxy and n is 0, 1 or 2. More preferably R is  $R''$  where  $R''$  is  $-\text{NH}(\text{R}_5'')$ ,  $-\text{N}(\text{R}_6'')$ , (where  $R_5''$  and  $R_6''$  are defined below) or a saturated heterocyclic amine group attached to the triazinyl group  
 20 through the N-atom.

Preferably  $R_1$  is  $R_1'$  where  $R_1'$  has a significance of  $R'$ , independent of  $R'$ ; more preferably  $R_1$  is  $R_1''$  where  $R_1''$  has a significance of  $R''$  independent of  $R''$ .



Preferably both groups R are the same and both groups R<sub>1</sub> are the same.

Preferably R is not the same as R<sub>1</sub> on the same triazinyl group.

Preferably in a process according to the invention, in the  
5 compound of formula I, R is R' and R<sub>1</sub> is R<sub>1</sub>' where R' and R<sub>1</sub>' are as defined above. Preferably R' is R'' and R<sub>1</sub> is R<sub>1</sub>'' defined above.

More preferably R is unsubstituted anilino and R<sub>1</sub> is more preferably unsubstituted morpholino.

Preferred heterocyclic amine groups are unsubstituted  
10 morpholino, unsubstituted piperazinyl; unsubstituted N-methyl piperazinyl; unsubstituted pyrrolidinyl and unsubstituted piperidinyl.

Preferably R<sub>4</sub> is hydrogen.

Preferably R<sub>5</sub> is R<sub>5</sub>' where R<sub>5</sub>' is phenyl, unsubstituted or substituted by one or two halogen, C<sub>1-4</sub>alkoxy, sulpho or C<sub>1-4</sub>alkyl  
15 groups; or is C<sub>1-4</sub>alkyl, unsubstituted or monosubstituted by one hydroxy, C<sub>1-4</sub>alkoxy or cyano.

More preferably R<sub>5</sub> is R<sub>5</sub>" where R<sub>5</sub>" is phenyl, unsubstituted or substituted by one chloro, methyl, methoxy or sulpho group; or is C<sub>1-4</sub>alkyl or C<sub>2-4</sub>hydroxyalkyl. Most preferably R<sub>5</sub> is unsubstituted  
20 phenyl.

Preferably the sulpho group in the stilbene group is ortho to the ethene group.

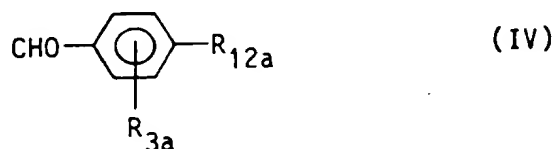
Preferably R<sub>6</sub> is R<sub>6</sub>' where R<sub>6</sub>' is unsubstituted C<sub>1-4</sub>alkyl or C<sub>2-4</sub>alkyl monosubstituted by C<sub>1-4</sub>alkoxy, cyano, -CONH<sub>2</sub> or hydroxy;

More preferably  $R_6$  is  $R_6^*$  where  $R_6^*$  is  $C_2-4$ alkyl, unsubstituted or monosubstituted by hydroxy ; or is methyl.

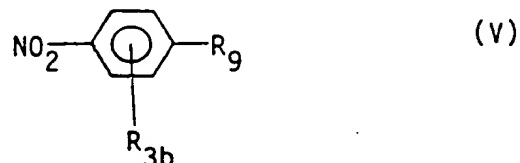
Preferred salt forms include alkali metal salts, alkaline earth metal salts and ammonium salts.

- 5 Still further according to the invention there is provided a process for preparing a compound of formula II comprising:

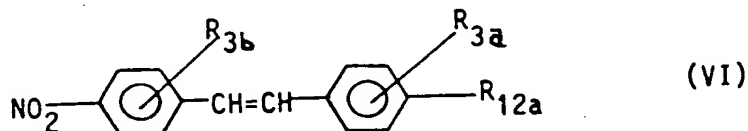
a) reacting a compound of formula IV



where  $R_{12a}$  is  $NO_2$  or  $-NH-CO-CH_3$  and  $R_{3a}$  is defined below with a compound of formula V



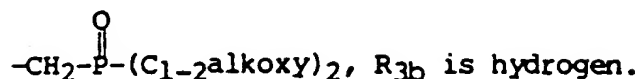
- 10 where  $R_9$  is  $-CH_2-P(=O)(C_{1-2}alkoxy)_2$ ,  $-CH_3$ ,  $-CH_2CN$  or  $-CH_2COOC_{1-6}alkyl$  and one of  $R_{3a}$  and  $R_{3b}$  is  $SO_3H$  and the other is hydrogen, to form a compound, of formula VI



and

- b) reducing and optionally hydrolysing the compound of formula VI to form a compound of formula II.

Preferably when  $R_9$  in the compound of formula V is



When a compound of formula IV is reacted with a compound of

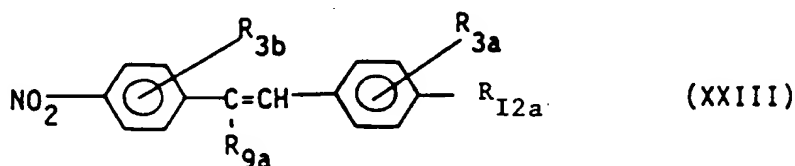
formula V where  $R_9$  is  $-\text{CH}_2-\overset{\text{O}}{\underset{\text{||}}{\text{P}}}-(\text{C}_1\text{-}_2\text{alkoxy})_2$ , preferably the pH of the  
 5 reaction is from 8-14 (more preferably 12-14) and the reaction is  
 carried out in the presence of a strong alkali (e.g. KOH or NaOH).  
 The preferred temperature range of this reaction is from 10-100°C,  
 more preferably from 20-40°C. Preferred solvents for the reaction of  
 a compound of formula IV with that of formula V are polar aprotic  
 10 solvents, preferably dimethylformamide, dimethylsulphoxide,  
 dimethylacetamide; and  $\text{C}_1\text{-}_8$ alcohols e.g. isopropanol and  
 ethoxyethanol. More preferred solvents are those selected from  
 dimethylformamide or dimethylsulphoxide; most preferred being  
 dimethylformamide. Usually the yield is 50 to 90 % of theory.

15 When a compound of formula IV, where  $R_{3a}$  is  $-\text{SO}_3\text{H}$ , is reacted  
 with a compound of formula V where  $R_9$  is  $-\text{CH}_2\text{CN}$  or  $\text{CH}_2\text{COOC}_1\text{-}_6\text{alkyl}$ ,  
 preferably the temperature of the reaction is from 100-160°C and the  
 pH is preferably from 9-12. Preferably the solvent is dimethyl-  
 sulphoxide or a mixture of dimethylsulphoxide and petroleum spirit  
 20 (b.p. 100-120°C). Preferably the reaction is carried out in the  
 presence of a strong base, for example piperidine, piperazine, sodium  
 carbonate or morpholine. Usually the yield is 40 to 80 % of theory.

Preferably when a compound of formula IV is reacted with a  
 compound of formula V where  $R_{3b}$  is  $-\text{SO}_3\text{H}$  and  $R_9$  is  $-\text{CH}_2\text{CN}$  or  
 25  $-\text{CH}_2\text{COOC}_1\text{-}_6\text{alkyl}$ , the reaction is carried out in a  $\text{C}_1\text{-}_6$ alcohol (e.g.  
 methanol or ethanol) or a  $\text{C}_2\text{-}_6$  glycol ethoxyethanol or methoxy-  
 propanol; and when  $R_{3b}$  is  $\text{SO}_3\text{H}$  and  $P_9$  is  $\text{CH}_3$  then the reaction is  
 carried out in dimethylformamide or dimethylsulphoxide. Preferably  
 the pH of this reaction is from 10-12 and preferably the temperature

range is from 50-150°C, more preferably from 70-120°C. Preferably this reaction is carried out in the presence of a catalyst, e.g. in the presence of a strong alkali such as piperidine, piperazine, morpholine or sodium carbonate. Usually the yield is 40 to 80 % of theory.

In the reaction of the compound of formula IV with a compound of formula V where  $R_9$  is  $-\text{CH}_2\text{CN}$  or  $-\text{CH}_2\text{COOC}_{1-6}\text{alkyl}$ , a compound of formula XXIII



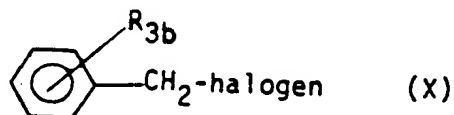
where  $R_{9a}$  is  $-\text{CN}$  or  $-\text{COOC}_{1-6}\text{alkyl}$ , is formed before formation of the corresponding compound of formula II.

The  $R_{9a}$  group can be removed by hydrolysis as follows:

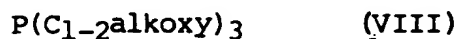
The CN or  $\text{COOC}_{1-6}\text{alkyl}$  group is converted to  $-\text{COOH}$  the acid group by the addition of strong alkali (e.g. KOH or NaOH) and this acid group can be removed by heating the compound of formula XXIII where  $R_{9a}$  is  $-\text{CO}_2\text{H}$  at a high temperature (e.g. 100-200°C) using copper powder.

Preferably reduction and/or hydrolysis of a compound of formula VI to the corresponding compound of formula II is carried out using sodium sulphide, preferably at an elevated temperature, more preferably 40 to 80°C. Reduction may also be effected by reacting a compound of formula VI with iron filings, at an elevated temperature preferably 80-120°C, with an organic acid, e.g. acetic acid. Usually the yield is 50 to 90 % of theory.

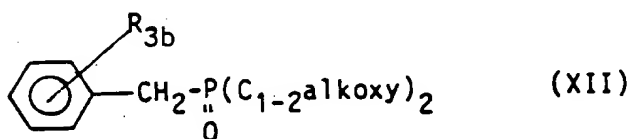
Compounds of formula Y where  $R_9$  is  $-\text{CH}_2-\text{P}(=\text{O})(\text{C}_{1-2}\text{alkoxy})_2$  and  $R_{3b}$  is  $-\text{H}$  can be prepared by reacting a compound of formula X



with a compound of formula VIII

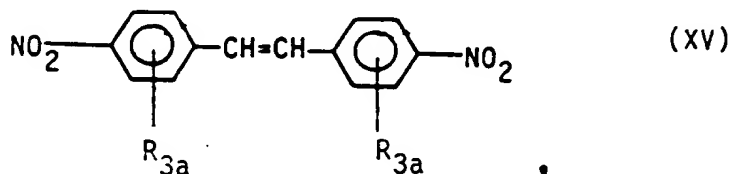


5 to form a compound of the formula XII



which is then nitrated (preferably with fuming nitric acid) to form the compound of formula Y where  $R_9$  is  $-\text{CH}_2-\text{P}(=\text{O})(\text{C}_{1-2}\text{alkoxy})_2$ .

Compounds of formula IV where  $R_{3a}$  is  $-\text{SO}_3\text{H}$  and  $R_{12a}$  is  $\text{NO}_2$ , can be prepared by oxidising a compound of formula XV



10 preferably in an alcohol-containing solvent system. More preferably the solvent system is ethoxyethanol or the solvent system

- is polyethylene glycol in water; most preferably the solvent system is polyethylene glycol in water. Preferably the molecular weight of the polyethylene glycol is from 300 to 600. Preferably the reaction is carried out in the presence of an electrolyte, more preferably
5. magnesium sulphate in water.

- Preferably the pH of the oxidation reaction is from 8 to 10 and preferably the temperature is from 0 to 100°C, more preferably from 0 to 50°C. Preferred oxidising agents are potassium permanganate, ozone, osmium tetroxide, lead tetraacetate, sodium permanganate or a
- 10 mixture of potassium periodate and potassium permanganate. Oxidation may also be carried out electrochemically. Usually the yield is 30 to 80 % of theory.

Compounds of formulae II, III, V, and VIII are known or can be made from known compounds by known methods.

- 15 The compounds of formula I are useful as optical brighteners for addition to detergent compositions and for brightening of textile fabrics and paper. They can be used in the manner disclosed in Example 6 of US Patent 3,895,009, the disclosure of which is incorporated herein by reference.

- 20 In this Specification, any sulpho group may be in salt form (preferably in alkali or alkaline earth metal salt form, more preferably the Na<sup>+</sup> salt) or in free acid form. However, for the sake of convenience any such sulpho group appearing in a formula has been shown in its free acid form, except in the following Examples.

The invention will now be illustrated by the following Examples in which all temperatures are in °C.

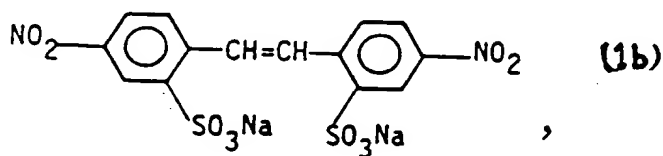
Example 1

The compound of formula 1a



5 can be prepared as follows:

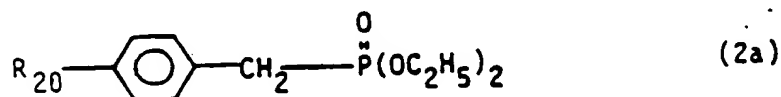
A slurry of 235 g of the compound of formula 1b



1000 g of water and 1000g of methoxypropanol are heated to reflux to form a clear solution, which is then cooled to 0°C and a solution of 117 g of  $\text{KMnO}_4$  and 120 g of magnesium sulphate in 2000 g of water are added at 0°C over 1 hour. The precipitated  $\text{MnO}_2$  is filtered off and the filtrates are concentrated until the aldehyde of formula 1a crystallises out and it is then filtered from the mother liquor.

Example 2

a) The compound of formula 2a

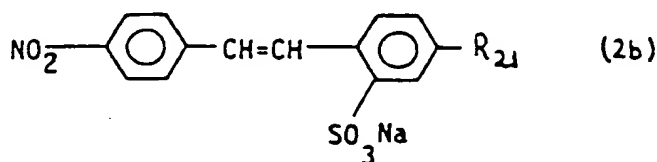


where  $R_{20}$  is  $-\text{NO}_2$ ,  
can be prepared as follows

791.2 g of nitrobenzyl bromide are refluxed at  $130^\circ\text{C}$  with 669 g of triethylphosphite in 1000 g of xylene. The ethylbromide resulting 5 is distilled off. 1000 g of the phosphonate of formula 2a result. Excess triethylphosphite and xylene can be removed by heating the mixture under vacuum.

b) 503 g of the compound of formula 2a (prepared above) are mixed with 470 g of the compound of formula 1a in 100 g of KOH and 10  
10 litres of dimethylformamide.

The reactants are warmed slowly up to  $50^\circ\text{C}$  and stirred for 3 hours under nitrogen and are poured onto an equal volume of water. The product that results is of formula 2b

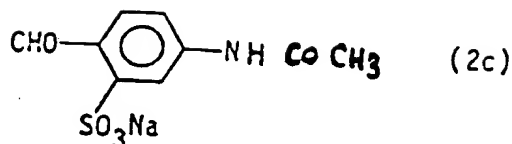


where  $R_{21}$  is  $-\text{NO}_2$ ,  
15 and is filtered from the solution.

The above method can be repeated using 462.4 g of benzyl chloride instead of 791.2 g of nitrobenzyl bromide. However, prior to adding 503 g of the phosphonate to the compound of formula 1a, the phosphonate is nitrated as follows:

20 500 g of the phosphonate of formula 2a, where  $R_{20}$  is hydrogen, is added dropwise to 1000 g of ice cold fuming nitric acid, over 1 hour at  $0^\circ\text{C}$ . This is stirred for a further hour at  $0^\circ\text{C}$  and the reaction mixture is poured onto 5000 g of crushed ice. The organic phase is separated off and washed well with water. An equivalent amount of the compound of formula 2c





may be used alternatively instead of 470 g of the compound of formula 1a to form a compound of formula 2b, where R<sub>21</sub> is -NHCOCH<sub>3</sub>.

### Example 3

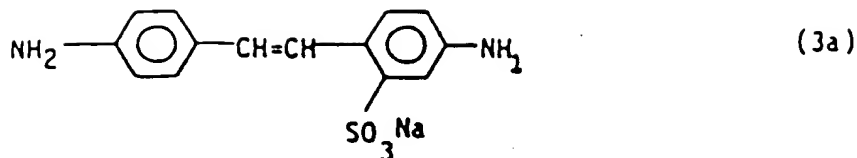
i) 92 g of a wet cake containing the compound of formula 1a (56.75% actives) are added to a slurry of 25 g of sodium carbonate and 137 g of dimethylsulphoxide. The mixture is heated under vacuum and water is removed, after which the mixture is cooled to 90°C. Then 33.2 g of p-nitrotoluene, 7.14 g of piperidine and 46.8 g of 100/120 petroleum spirit are added.

10 The mixture is subjected to slow azeotropic distillation and during which water of the condensation, dimethyl sulphoxide and some piperidine separate out from the petroleum spirit distillate.

After about 10 hours, 3.57 g of piperidine is added and the mixture is refluxed for about 20 further hours. The reaction is  
 15 cooled to 70° and the piperidine and petroleum spirit is distilled off under vacuum. The mixture is cooled to 50°C. 65.6 g of methoxy propanol followed by 74.9 g of ethyl acetate are added.

The mixture is warmed to 60° and a warm (60°C) solution of 58.1 g of sodium sulphide dissolved in 91.3 g of water is added dropwise  
 20 over 2 hours at 80 to 85°C.

83 g of 4 % of NaCl is added and the reaction is kept at 60°C for 8 hours with slow stirring. The product of formula 3a



results.

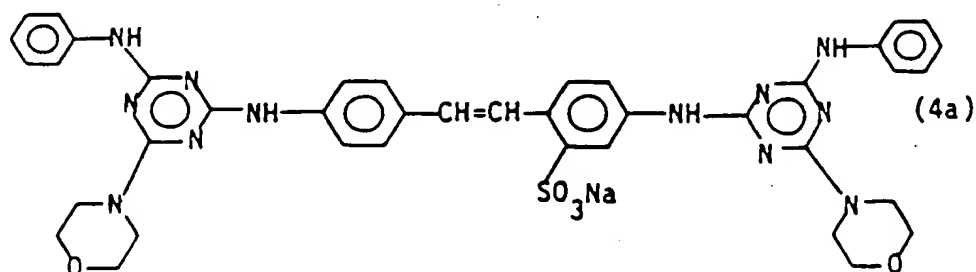
ii) Alternatively, 92 g of a wet cake containing the compound of formula 1a (56.4 % actives) are added to a slurry of 25 g of sodium carbonate and 200 g dimethylformamide. The mixture is heated under vacuum until the water is removed. 40 g of 4-nitrophenylacetonitrile, 7 g of piperidine and 46.8 g of 100/120 petroleum spirit are added. The mixture is heated under azeotropic distillation for 5 hours. Piperidine and petroleum spirit are removed by vacuum distillation and 30 g of concentrated hydrochloric acid are added to the mixture. The mixture is refluxed for 10 hours, cooled and neutralized with sodium hydroxide solution. The precipitated nitro compound of formula 2b is filtered off.

Reduction to the amine of formula 3a may be carried out by reducing with sodium sulphide as above.

Example 3 ii) can be repeated using 54g of 4-nitrophenylacetic acid ethyl ester instead of 40 g of 4-nitrophenylacetonitrile.

#### Example 4

The compound of formula 4a



can be prepared from the compound of formula 3a defined in Example 3 as follows:

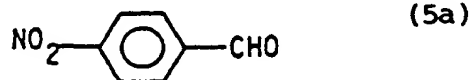
3449 g of methyl ethyl ketone (MEK) in a first vessel are cooled to 0°C. 493 g of cyanuric chloride is added whilst stirring  
5 until it is fully dissolved in the MEK.

1379 g of demineralised water are placed in a second vessel and 758.8 g of a 50 % wet cake of the product of formula 3a (defined in Example 3) are added to the water whilst stirring. The resulting slurry is pumped onto the cyanuric chloride solution in the first  
10 vessel whilst maintaining the temperature from -2°C to +2°C and the pH between 4 and 5 by the addition of 138 g of sodium bicarbonate portion by portion. When the addition is finished 40 g of sodium bicarbonate are added to bring the pH to 6.5.

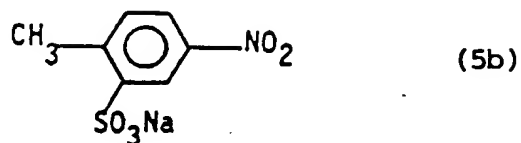
226 g of aniline are added and 360 g of a 30 % sodium hydroxide  
15 and 1000 g of water are slowly added to keep the pH between 6.5 and 7. The temperature is allowed to rise. When the reaction is ended and the temperature has risen to 30°C with the pH at 6.5, 440 g of morpholine are added and the mixture is heated to 70°C. 12 g of sodium hydrosulphite are added to improve the colour. The mixture is  
20 refluxed and 3339 g of MEK are distilled off. The resulting mass is cooled to 50°C and filtered and washed. The resulting product is the compound of formula 4a.

#### Example 5

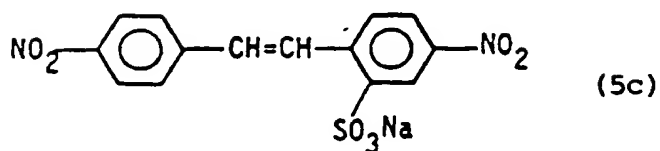
By a method analogous with that of Example 3 i), (via the Knoevenagel reaction) 1 mol of the compound of formula 5a



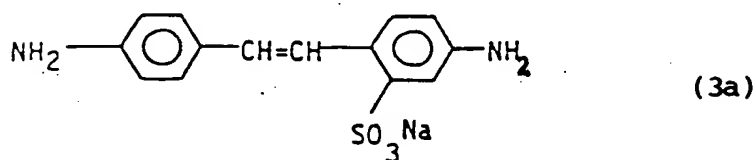
is reacted with 1 mol of the compound of formula 5b



to give 1 mol of the compound of formula 5c

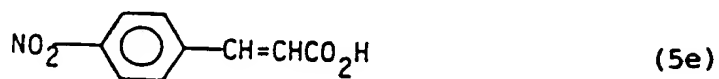


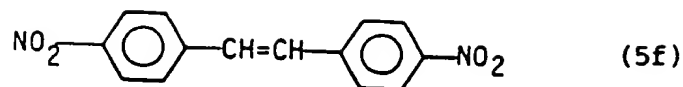
This is then reduced by a method analogous to that of Example 3i) to the compound of formula 3a



5 using sodium sulphide.

The compound of formula 5a can be prepared by oxidation with potassium permanganate of the compound of formula 5e or 5f

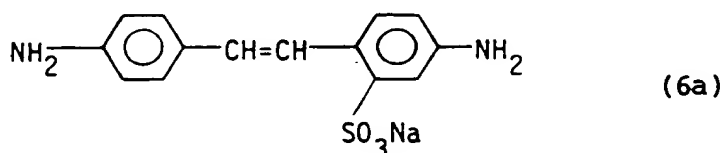




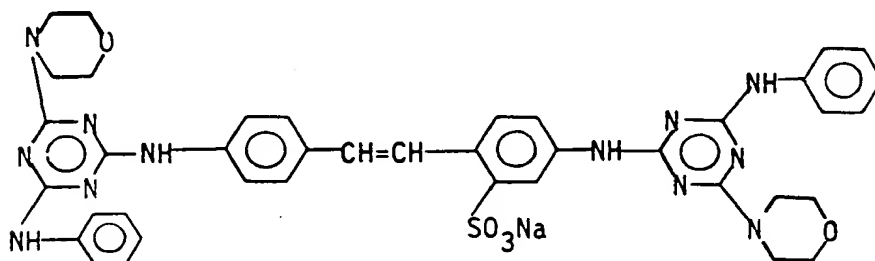
according to known methods of Example 1. The compound of formula 5b can be made by known methods from known compounds.

Example 6

2.7 litres of methylethylketone are cooled to  $-15^{\circ}\text{C}$  and 142 g of cyanuric chloride are added. 73 g of aniline are slowly added, keeping the temperature less than  $-3^{\circ}\text{C}$ . 40 g of sodium bicarbonate are then added followed by 110 g of the compound of formula 6a;

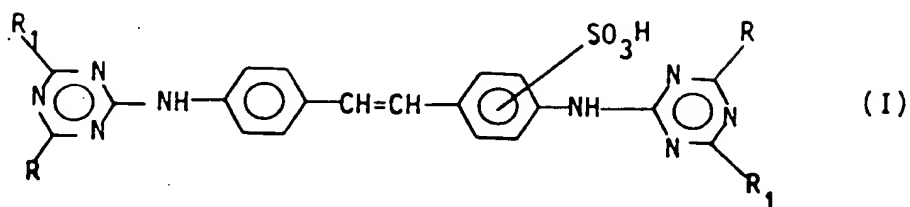


in a slurry in 1000 g of water. The pH is kept at 6 by the addition of dilute NaOH and the temperature is raised slowly to  $65^{\circ}\text{C}$ . The pH is then adjusted to 7 and the reaction is diluted with 1.8 l of water. 146 g of morpholine are added followed by 10 g of sodium hydrosulphate. The reaction is heated to reflux and 2.5 l of methylethyl ketone are distilled off. The mixture is cooled and the product filtered off to give a 95 % yield of



CLAIMS: -

1. A process for preparing a compound of formula I



in which R is  $-NR_5R_6$ ,  $-SCH_3$ , halogen or  $-OR_5$ ;

$R_1$  has a significance of R, independent of R,

$R_5$  is hydrogen; phenyl, unsubstituted or substituted by one  
 5 or two halogen atoms,  $C_{1-4}$ alkoxy, sulpho, mono- or  
 di- $(C_{1-4}$ alkyl)-amino or  $C_{1-4}$ alkyl groups;  $C_{1-4}$ alkyl unsubstituted or  
 monosubstituted by hydroxy,  $C_{1-4}$ alkoxy or cyano;  
 $-(CH_2-CH(R_{10a})-O)_m-R_{10}$ ;  $-(C_{1-4}alkylene)-CON(R_{10})_2$ ;  
 $-(CH_2)_p-N(R_{10})_2$  or  $-(CH_2)_p-N^+(R_{10})_3 A^-$

10 where  $R_{10}$  is hydrogen or  $C_{1-4}$ alkyl, m is an integer from 1 to  
 10 inclusive, p is an integer from 1 to 4 inclusive,  $R_{10a}$  is hydrogen  
 or methyl and  $A^-$  is an anion;

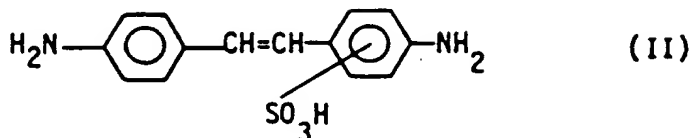
$R_6$  is hydrogen; unsubstituted  $C_{1-4}$ alkyl; phenyl unsubstituted  
 or substituted by one  $C_{1-4}$ alkyl group;  $C_{2-4}$ alkyl substituted by one  
 15 hydroxy,  $C_{1-4}$ alkoxy or cyano group;  $-(CH_2-CH(R_{10a})-O)_m-R_{10}$ ;

$-(C_{1-4}alkylene)-CON(R_{10})_2$ ;  $-(CH_2)_p-N(R_{10})_2$  or  $-(CH_2)_p-N^+(R_{10})_3 A^-$

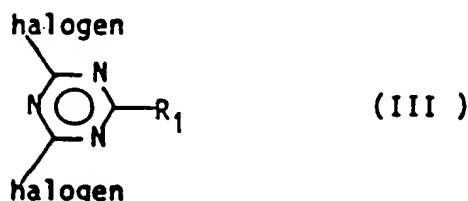
where  $R_{10}$ ,  $R_{10a}$ , p,  $A^-$  and m are as defined above;

or  $R_5$  and  $R_6$  together with the N-atom to which they are  
 attached form a saturated heterocyclic amine group;

comprising reacting one mole of a compound of formula II



with 2 moles of a compound of formula III



to form a compound of formula I,  $R_1$  is as defined above and R is halogen; and

5 optionally further reacting with a compound of formula IIIa

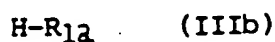


where  $R_a$  is  $-NR_5R_6$ ,  $-SCH_3$  or  $OR_5$ ,  
to form a compound of formula I where R is  $R_a$  where  $R_a$  is selected  
from  $-NR_5R_6$ ,  $-SCH_3$  and  $OR_5$  and  $R_1$  is as defined above.

2. A process according to Claim 1 comprising

10 a) reacting one mole of a compound of formula II as defined in Claim 1 with 2 moles of a compound of formula III as defined in Claim 1 where  $R_1$  is halogen to form a compound of formula I where R and  $R_1$  are halogen;

b) optionally reacting the compound of formula I where R and  $R_1$  are halogen with a compound of formula IIIb



where  $R_{1a}$  is  $-NR_5NR_6$ ,  $-SCH_3$  or  $-OR_5$ ;  
to form a compound of formula I where  $R_1$  is  $R_{1a}$  and R is halogen;

c) optionally reacting the compound of formula I where R is halogen and  $R_1$  is  $R_{1a}$  defined above; with a compound of formula IIIa

H-Ra (IIIa)

where  $R_a$  is  $-NR_5R_6$ ,  $-SCH_3$  or  $-OR_5$ ;

to form a compound of formula I where R is  $R_a$  and  $R_1$  is  $R_{1a}$  as defined above.

- 5 3. A process according to Claim 1 or Claim 2, in which R is  $R'$  where  $R'$  is  $-NH_2$ ,  $-N(R_6')_2$ ,  $-NHR_5'$ ,  $-SCH_3$ ,

halogen,  $\begin{array}{c} R_8 \\ | \\ -N-(CH_2)_n-CH \\ | \\ CN \end{array}$  ;  $-OR_8$  ,  $-O-\text{C}_6\text{H}_5$  or a saturated

- heterocyclic amine group attached to the triazinyl group through the N-atom; where  $R_4$  is hydrogen or methyl,  $R_5'$  is phenyl, unsubstituted  
10 or substituted by one or two halogen,  $C_{1-4}$ alkoxy, sulpo or  $C_{1-4}$ alkyl groups; or is  $C_{1-4}$ alkyl, unsubstituted or mono-substituted by hydroxy,  $C_{1-4}$ alkoxy or cyano; and  $R_6'$  is unsubstituted  $C_{1-4}$ alkyl or  $C_{2-4}$ alkyl monosubstituted by  $C_{1-4}$ alkoxy, cyano,  $-CONH_2$  or hydroxy; and  $R_8$  is hydrogen,  $C_{1-4}$ alkyl or  $C_{2-4}$ alkyl substituted by  $-OH$  or  
15  $C_{1-4}$ alkoxy and n is 0, 1 or 2.

4. A process according to Claim 3, in which  $R_1$  is  $R_1'$  where  $R_1'$  has a significance of  $R'$  defined in Claim 3, independently of the significance of R.

5. A process according to Claim 1, in which both groups R and  
20 both groups  $R_1$  are the same.

6. A process according to Claim 5, in which R and  $R_1$  on the same triazinyl are not the same.



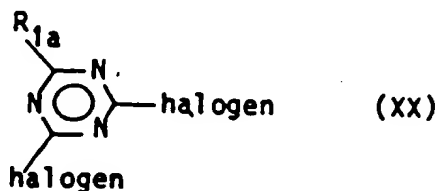
7. A process according to Claim 1, in which both groups  $R_1$  are morpholino and both groups R are anilino.

8. A process according to any one of the preceding claims in which the reaction of the compound of formula II with that of formula III where  $R_I$  is halogen, is carried out at a pH of 1.5 to 6 and a temperature of  $-15^{\circ}\text{C}$  to  $+5^{\circ}\text{C}$ .

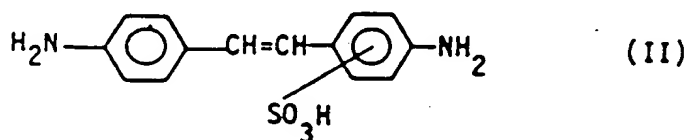
9. A process according to any one of the preceding claims for preparing a compound where R and  $R_1$  are other than halogen in which when  $R_1$  and R are halogen and the first halogen is reacted with  $\text{H-R}_a$ ,  
10 the pH is from 4-8 and the temperature is from 2 to  $65^{\circ}\text{C}$  and when the second halogen is reacted with  $\text{H-R}_{1a}$ , the pH is 7 to 10 and the temperature of the reaction from 40 to  $100^{\circ}\text{C}$ .

10. A process for preparing a compound of formula I, as defined in Claim 1, in which R is  $\text{R}_a$  where  $\text{R}_a$  is  $-\text{NR}_5\text{R}_6$ ,  $-\text{SCH}_3$  or  
15  $-\text{OR}_5$  as defined in Claim 1 and  $R_1$  is  $R_{1a}$  where  $R_{1a}$  is a significance of  $R_1$  independently of  $R_2$  comprising reacting

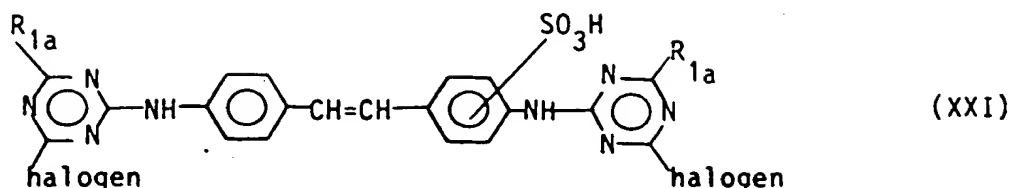
a) 2 moles of cyanuric halide with 2 moles of  $\text{H-R}_{1a}$  to form a compound of formula XX



b) reacting 2 moles of the compound of formula XX with 1 mole  
20 of the compound of formula II



to form a compound of formula XXI



and

c) reacting 1 mole of the compound of formula XXI with 2 moles of  $H-R_2$  to form a compound of formula I where R is  $R_a$  and  $R_1$  is  $R_{1a}$  as defined above.

11. A process according to Claim 10, in which both groups  $R_a$  are morpholino and both groups  $R_{1a}$  are anilino.

12. A process according to Claim 10 or Claim 11, in which the reaction of cyanuric halide with  $H-R_{1a}$  is carried out at  $-15^{\circ}C$  to  $-5^{\circ}C$  at a pH of 1-4.

10 13. A process according to any one of Claims 10 to 12, in which the reaction of a compound of formula XX with that of formula II is carried out at a temperature of from  $10-50^{\circ}C$  and at a pH of 5 to 7.

14. A process according to any one of Claims 10 to 13, in which the reaction of a compound of formula XXI with  $H-R_a$  is carried out at a temperature of  $40-100^{\circ}C$  and at a pH of 7-10.

15. A process for preparing a compound of formula I, defined in Claim 1, in which both groups R and/or both groups  $R_1$  are  $-OC_6H_5$  comprising

20 a) reacting 2 moles of cyanuric halide with 1 mole of the

compound of formula II defined in Claim 1; and

b) reacting the product with 2 or 4 moles of phenol.

16. A process according to Claim 15, in which reaction step b is carried out at a temperature of from 50 to 80°C.

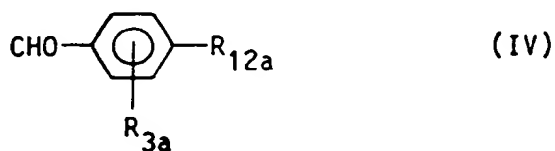
5 17. A process according to Claim 1, for preparing a compound of formula I, in which both groups  $R_1$  are morpholino and both groups R are unsubstituted anilino comprising reacting:

a) 1 mole of a compound of formula II with 2 moles of cyanuric halide;

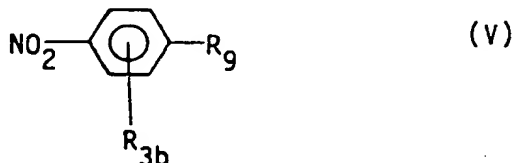
10 b) reacting the product either with 2 moles of aniline followed by 2 moles of morpholine or with 2 moles of morpholine followed by 2 moles of aniline.

18. A process for preparing a compound of formula II defined in Claim 1 comprising

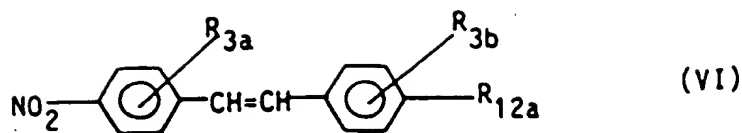
15 a) reacting a compound of formula IV



where  $R_{12a}$  is  $NO_2$  or  $-NH-CO-CH_3$  and  $R_{3a}$  is defined below with a compound of formula V



where  $R_9$  is  $-CH_2-\overset{O}{\parallel}P-(C_{1-2}alkoxy)_2$ ,  $-CH_3$ ,  $-CH_2CN$  or  $-CH_2COOC_{1-6}alkyl$  and one of  $R_{3a}$  and  $R_{3b}$  is  $SO_3H$  and the other is hydrogen; to form a compound, of formula VI



and

b) reducing and optionally hydrolysing the compound of formula VI to form a compound of formula II.

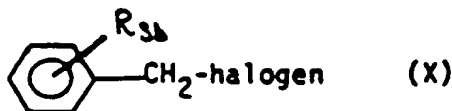
19. A process according to Claim 18, in which in the compound  
5 of formula V,  $R_9$  is  $-\text{CH}_2-\text{P}(=\text{O})(\text{C}_{1-2}\text{alkoxy})_2$  and in the compound of

formula IV,  $R_{3a}$  is  $-\text{SO}_3\text{H}$ , in which the reaction a) is carried out at a temperature of, from 10-100°C and at a pH of 8-14.

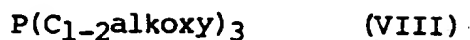
20. A process according to Claim 18, in which in the compound  
of formula V,  $R_9$  is  $-\text{CH}_3$ ,  $-\text{CH}_2\text{CN}$  or  $-\text{CH}_2\text{COOC}_{1-6}\text{alkyl}$  and  $R_{3b}$  is hydrogen  
10 in which the reaction a) is carried out at a temperature of 100-160°C and at a pH of 9-12.

21. A process according to Claim 17, in which in the compound  
of formula V,  $R_9$  is  $-\text{CH}_3$ ,  $-\text{CH}_2\text{CN}$  or  $-\text{CH}_2\text{COOC}_{1-6}\text{alkyl}$  and  $R_{3b}$  is  
 $-\text{SO}_3\text{H}$  in which the reaction is carried out at a pH of from 10-12  
15 and at a temperature of from 50-150°C.

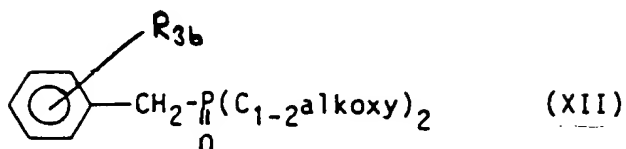
22. A process for preparing a compound of formula V where  $R_3$  is -H  
and  $R_9$  is  $-\text{CH}_2-\text{P}(=\text{O})(\text{C}_{1-2}\text{alkoxy})_2$  comprising reacting a compound of formula X



with a compound of formula VIII



to form a compound of the formula XII



which is then nitrated to form the compound of formula V  
 5 defined in Claim 18, where  $R_9$  is  $-CH_2-P(=O)(C_{1-2}alkoxy)_2$ .

23. A process for preparing a compound of formula I as defined in Claim 1, substantially as herein described with reference to any one of Examples 4 to 11 and 13.

24. A process for preparing a compound of formula II as  
 10 defined in Claim 1, substantially as herein described with reference to Examples 3 and 12.

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